



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ENTOMOLOGY.¹

[SALUTATORY.—Having decided to discontinue the publication of the AMERICAN ENTOMOLOGIST, we hope to transfer the interest it represents to the pages of the NATURALIST, and bespeak for it the support of the subscribers and contributors to the first-named magazine. We shall not lose sight of the economic bearings of entomology, and hope to make the NATURALIST a welcome visitor not only to the student of insects, but to him or her whose principal anxiety is to protect from the injuries of these tiny marauders whether flower, fruit, cereal, shade tree or other product. As in the columns of the *American Entomologist*, we shall here consider and answer such questions as are of public interest, and we invite correspondence alike from the practical man, the amateur and the specialist. Separate copies of contributed articles will be furnished when required. We will also send the complete volume of the *American Entomologist*, just brought to a close, to any one desiring it, upon receipt of the club subscription rate, \$1.50.—C. V. R.]

BIOLOGICAL NOTE ON EUPLECTRUS COMSTOCKII Howard.—During my stay in Selma, Ala., engaged in work for the U. S. Entomological Commission, from the end of August till October 12th of this year, I had ample opportunity to observe the above named interesting parasite of the cotton worm, and the following notes on its life history may, perhaps, prove not without interest, though they contain nothing new beyond Fonscolombe's observations on this and allied genera of Chalcididæ.

Though I often saw the perfect parasite on the leaves of the cotton plant, I never was fortunate enough to observe the act of egg-laying, and am, therefore, unable to state the length of time necessary for the egg to hatch. All the eggs which came under my observation always hatched either the same or the next day. Judging, however, from the rapid development of the insect under consideration, it is more than probable that the time elapsing from the laying of the egg to the issuing of the parasitic larva, does not much exceed two days. The egg is elongate-oval, strongly convex above and somewhat flattened beneath; no sculpture is visible under an ordinary lens. Its color is uniformly brown, and almost black just before hatching. The number of eggs laid by the female Euplectrus on a single Aletia larva, I found to vary from one to fifteen, the most common numbers being three, five and seven. They are always laid in a group, but the individual eggs sufficiently separate from each other to allow room for the development of the larvæ. In one instance I found two separate egg-groups on an Aletia larva, and these were, in all probability, laid by two females of Euplectrus. When only one or two eggs are found upon a worm, the presumption is that the

¹ This department is edited by PROF. C. V. RILEY, Washington, D. C., to whom communications, books for notice, etc., may be sent.

latter has been able to remove one or more of them, or that they dropped off from one cause or another. Eggs that have failed to hatch but that adhere to the worms are sometimes met with.

The Aletia larvæ attacked by this parasite are usually less than one-third grown, but not less than one day old. Exceptionally they are rather more than one-third grown. The eggs of the Euplectrus are usually laid on the middle of the back of the worm, sometimes a little more in front or behind or more towards the sides, and in one instance I saw them fastened immediately above one of the middle pair of thoracic legs.

The delicate egg-shell splits longitudinally in the middle of the back and discloses the white larva of the parasite, which gradually works the egg shell more and more down the sides of its body where, for some hours, it remains visible as a black line, but within less than twelve hours it disappears from view beneath the rapidly growing parasite larva. This last, as soon as it has freed its head from the egg shell, pierces the skin of its victim and thereafter remains stationary with its head buried. As soon as it has fairly begun to feed, the white color changes to a bright bluish-green, and the segments and spiracles which in the newly hatched larva were barely visible under high magnifying power, are now readily seen. The growth of the larva is very rapid, but seems to vary according to the season, averaging three days in August and four days in September. When full-grown the larvæ crowd each other, and if there are five or more of them on a caterpillar, they form a semi-globular lump of very striking appearance. Usually their growth is uniform, and retardation in development of individuals in the group results in death. When full-grown they turn yellowish-white and relax their hold.

The worm which up to this time showed no signs of being affected, except by its sickly yellowish color, and by its very slow growth, collapses and dies as soon as a single one of the parasitic larvæ withdraws, and the same fate overtakes those Euplectrus larvæ which are at the time less advanced in their development, or immature. If one of the parasitic larvæ be removed by hand, both the victimized worm and the remaining parasites quickly dry up.

The presumption that the Euplectrus larvæ may migrate from one worm to another is unfounded, they always remain stationary on the worm, which the parent fly has chosen as its victim, and they never even move from the spot where the egg has been laid until they are full grown. Every attempt I made to transplant a larva from one worm to another invariably resulted in the death of the parasite.

In preparing for pupation, the larvæ manage by a peculiar elongation and sudden contraction of their abdominal joints to work from the back of the worm to the ventral or attached side where they spin fine silken threads, which more fully secure the

worm, which is now a mere empty skin, to the leaf. As the *Euplectrus* larvæ take their places side by side, the caterpillar skin is fastened its whole length to the leaf if there are five or more of the parasites, but if there are fewer only one portion of the skin, usually the anterior end is fastened, the remaining portion either hanging down or breaking off. This web of the *Euplectrus* larvæ consists of an irregular mesh of yellowish-white silk, recalling some kinds of mold, and spun to secure the caterpillar skin to the leaf, in addition to a few other threads to prevent the pupa from being moved from its place. This web should not properly be called a cocoon, its character is excellently expressed in Fonscolombe's words as quoted by Westwood¹: "larva * * * ad metamorphosin filis aliquot sericis longiusculis crispis inordinatis involvitur."

Protected by the caterpillar skin as by a roof, the *Euplectrus* larva changes to the pupa, the color of which is dark honey-yellow, with the head and abdomen very soon becoming pitchy black. The duration of the pupa state varies from three to eight days.

The *Euplectrus* is subject to the attacks of a secondary parasite of its own family, and its pupa is sometimes destroyed by another enemy, probably some Carabid beetle.

Cotton worms infested with the *Euplectrus* were by no means rare during the month of September, and the almost complete destruction of the worms in the earlier part of October was principally due to this parasite, and to a species of *Microgaster* hitherto unmentioned as a parasite on *Aletia*.—*E. A. Schwarz, Washington, D. C.*

OVIPOSITION IN THE TORTRICIDÆ.—The remarks on this subject by the editor, in the November number of the *American Entomologist*, suggest that the observations I have made on the life history of *Tortrix fumiferana* Clem., may possibly be of interest.

I have been endeavoring for several years to carry this insect through all its stages, but have not yet been able to complete all the links in the chain. It was originally described by Clemens in 1865, under the above name, but doubtfully referred to the genus *Tortrix*, the type being the more common form of this variable species. Robinson seems to have overlooked this insect among the types of Clemens and re-described one of the reddish-brown varieties under the name of *Tortrix nigridea*.

Some three years ago I was informed that "worms in prodigious numbers were utterly destroying the evergreen forests" in some parts of this State, and a box of them, enclosed with some of the twigs, was sent to me, but was not received until after they had emerged and crawled over and among the twigs till they were denuded past recognition.

¹ Introd. II, p. 163.

The next year, however, I was able to get them sent to me in the larva and pupa states and had them emerge in confinement. Many, however, proved to be parasited and a large number of specimens of *Pimpla conquisitor* Say, together with several dipterous parasites and a hair-snake emerged from them. I could not convince myself that there was any difference in the activity of the larvæ, although nearly half of them finally proved to have contained parasites of large size.

The pupæ were kept in a glass observing cage, and soon after their emergence the sexes began to pair, quite irrespective of the time of day, some early in the morning, others in the middle of the day, and still others in the evening. It must be remembered that all my observations were made upon them in confinement, and that in nature, under different conditions, the ways of these insects *may* be somewhat different.

Having now a considerable number of impregnated females, they were disposed of so as to oviposit under different conditions. For one, a branch of fir (*Abies balsamea*) was supplied, this being their favorite food plant; others were put in dark boxes, while others were kept under glass beakers with no food plant.

The one provided with the branch of fir laid her eggs July 5th, about the middle of the forenoon. The manner of ovipositing was as follows: crawling upon the upper side of a leaf with her head towards the stem, she bent her abdomen down, depositing an egg a little to one side near the tip, then bending the abdomen a little to the other side she deposited another slightly overlapping the one already laid, then moving forward a bit and turning the abdomen to the other side another was laid, and so on till two continuous rows were laid upon the upper side, continuing to the base of the leaf, the eggs of the same row overlapping each other so much that not more than one-third of the upper side was free, while those of one row overlapped those of the other row by about a fourth of their width. After having finished the rows on one leaf, she went to another and continued as before, till one hundred and twenty-five were deposited.

The time required for the deposition of an egg was not far from five seconds, and the female continued her work almost without interruption till all those on one leaf were deposited; then an interval of a few minutes elapsed before she began on another.

The eggs are flattened, slightly elliptical, $1\frac{1}{2}$ mm. long and 1 mm. wide, of a bright green color, surface smooth under an ordinary lens.

I carefully watched another female with a lens, while ovipositing on the inside of a thin glass beaker. The abdomen was raised after the deposit of the egg and bent a little to one side, as described above, for the purpose of depositing a second egg; only in this case the eggs were not confined to two rows, but varied in number till as many as six or more rows were laid, forming an

irregular patch, apparently without order, sometimes entirely overlying each other so that it was impossible to make an exact count, but the mass contained not far from the same number as in the other case.

The opening to the ovipositor, immediately after the expulsion of an egg, opened and closed several times, the external side parts moving laterally, after which the abdomen was bent down, the opening distended and an egg excluded. There was no movement of the parts to arrange or place the egg, nor was there any further manipulation of the egg, on the part of the female, but at once the abdomen was raised, the usual movements of the opening and closing the orifice took place, when the apex was again bent down and another egg laid.

The eggs laid on the 5th of July began to show a dark spot near the free end about the 10th, which grew more and more visible till the 13th, when with the lens the dark spot showed itself to be the head of the embryo, and the green contents within could be resolved into the outline of the body doubled up. On the 15th of July, the young emerged, and a more restless lot of larvæ I do not remember to have seen.

These young do not eat the shells of the eggs as some larvæ do, but travel away from them as though their lives depended upon it. Finally some of them settled down in the axils of the leaves, spinning a few silken threads over and between the leaf and the stem. For a week they were quiet and I could not perceive that they had eaten anything since hatching. They had even lost the green color of the body and were now dull ochre yellow, except the head and thoracic plates, which were, as before, pitchy black.

At this time I transferred them to a living fir tree, but all died within a day or two, possibly because of the rough handling necessary to dislodge them.

If we may be permitted to *conjecture* the rest of their life history, they possibly spin themselves up in a cocoon in the axils of the leaf, where they remain during the fall and winter, coming out in the spring to feed up and pass through their later transformations.

The full-grown larva is 20 mm. in length, somewhat fusiform. Head of the ordinary form, jet black, as are also the middle joints of the antennæ, the legs and thoracic plate. The remaining joints of the antennæ, palpi, integument between the joints of the legs, mouth parts, front edge of the thoracic plate, and a narrow longitudinal line dividing the plate in two halves, dull light green. General color of the body above, dark brown, inclining to greenish-yellow between the segments. Tubercles, anal plate and prolegs, straw-yellow. A lateral yellowish stripe extends from the head to the last segment, having the stigmata in the center and enclosing on the lower side, the lateral folds of the segments, and in its upper edge, the second row of tubercles from the dorsum.

The anal plate is somewhat roughened and sparsely clothed

with stiff, yellowish hairs. Tubercles also surmounted by yellowish hairs. Underside dull greenish-brown, darker brown on the segments under the lateral fold.—*Prof. C. H. Fernald, State College, Orono, Maine.*

SUPPLEMENTARY NOTE ON THE FOOD OF THE BLUE-BIRD.—When my paper on the food of the blue-bird was prepared for the September and October numbers of the *Entomologist*, I had no material illustrating the food of the species for the months between July and December, except two stomachs taken in September, the contents of which were so far exceptional that I excluded them from the table of the food. Since the publication of that paper I have studied the food of the blue-bird in August and September, and find the record for those months so different from that of the months preceding that an exact idea of the economical relations of the species cannot be given without taking it into account.

Twelve specimens were obtained in August at Normal, Ill.—three early in the month and the others on the 29th and 30th. The blue-birds were at this time most abundant in meadows and pastures, and the contents of their stomachs indicate that the chief business of the month was the pursuit of locusts, crickets and grasshoppers, moths and caterpillars.

The Orthoptera eaten by these birds amounted to fifty-eight per cent. of their food, and the Lepidoptera to twenty-seven per cent. About half of the former were Gryllidæ (*Gryllus* and *Nemobius*), and the remaining half were equally Locustidæ and Acrididæ (*Xiphidium fasciatum* and *ensifer*, *Caloptenus femurrubrum* and *bivittatus* and *Edipoda sordida*).

Half of the Lepidoptera were unrecognizable moths, and the remainder caterpillars, five per cent. being Noctuidæ. Ants were about one per cent. of the food, Coleoptera only five per cent. (including three per cent. Harpalidæ), Cydnidæ (*Cænus delia*) one per cent., and spiders six per cent. A few wild cherries and elder berries were the only fruits taken. The beneficial elements thus amount to about nine or ten per cent. of the food, and the injurious elements to about eighty-five per cent.

All but one of the ten specimens upon which the account of the September food is based, were shot at Normal, and all but two on the twenty-ninth of the month. The chief peculiarity of the month is the almost total disappearance of Coleoptera, which were represented only by a few small Harpalids and a single minute *Atænius*. The Lepidoptera rise to thirty-seven per cent. chiefly through the abundance of the larva of *Prodenia lineatella* Harvey. The Orthoptera make just half the food, the species differing from those of the preceding month mainly in the greater number of red-legged locusts. Spiders were only two per cent. of the food, and some unknown wild fruits formed seven per cent.

It will be seen that a striking change in the food of this species attends the increase of the Orthoptera in numbers and activity,

which occurs in the late summer and early autumnal months, these insects being almost entirely substituted for Coleoptera, Hemiptera and Arachnida. The Coleoptera of the six preceding months averaged twenty-seven per cent. of the food, while this order amounts to but three per cent. in August and September. The Orthoptera of the foregoing months averaged but fourteen per cent., while those of the two months in question rise to fifty-four per cent. As a consequence of this seasonal change, the most important general averages for the year given in the table on page 234 of the October *Entomologist*, should be amended as follows:

The Coleoptera drop from twenty-five per cent. to twenty, the Harpalidæ lose one per cent, and the Scarabæidæ two per cent.; Hemiptera, Arachnida and Myriapoda each also drop one per cent.; Orthoptera rise from twelve per cent. to twenty-one, and Lepidoptera from twenty-four per cent. to twenty-six. The grand total of injurious elements stands, as amended, at fifty-one per cent., and of beneficial elements at twenty-three. It is evident from the foregoing, that Orthoptera and smooth caterpillars are the favorite food of this bird, and as the first of these remain abundant until frost, it is not likely that the food of October is much less favorable to the bird than that of September. The two specimens taken in the former month were well filled with winged ants.—*Prof. S. A. Forbes, Normal, Ill.*

[Prof. Forbes is carrying on a most important work in his systematic studies on the food habits of birds. He is really making the first serious and accurate study of the subject attempted in this country, and the results in the end cannot fail to set at rest many of the questions constantly raised by the ornithophiles on the one hand and the fruit and grain growers on the other. The question is one that interests alike the entomologist, the ornithologist and the husbandman. It will be well to remark that in the October number of the *Entomologist* alluded to in the above communication, which is supplementary thereto, the totals in his table summarizing the observations made, were as follows:

SUMMARY OF THE FOOD OF THE BLUE-BIRD.

		Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Ratio of each element to whole of Food.
No. of Specimens Examined.			10	21	13	9	10	9		2			12	86	
KINDS OF FOOD.		Number of specimens and Ratios in which each Element of Food was found.													Totals for the Species.
Percentages for Each Month	Beneficial Elements, .	.46	.28	.21	.35	.38*	.14						.11	.28	
	Injurious " .	.41	.60	.23	.55	.26	.67						.02	.39	
	Neutral " .	.13	.12	.56	.10	.34	.19						.87	.33	

* Includes 8 per cent. fruit.